HOUSE OF COMMONS

Science, Innovation and Technology Committee

Oral evidence: Emerging diseases and learnings from covid-19, HC 1303

Wednesday 14 June 2023

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Watch the meeting

Members present: Greg Clark (Chair); Dawn Butler; Katherine Fletcher; Rebecca Long Bailey; Stephen Metcalfe; Carol Monaghan.

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Witnesses

I: Professor Bryan Charleston, Director, The Pirbright Institute; Professor Sir Peter Horby, Director, Pandemic Sciences Institute.

II: Professor Nicola Lewis, Director at Worldwide Influenza Centre, Francis Crick Institution; Professor James Wood OBE, Head of Department of Veterinary Medicine, University of Cambridge.

III: Professor Andrew Cunningham, Deputy Director of Science, Institute of Zoology; Professor Dirk Pfeiffer, Deputy Director, One Health Poultry Hub.

Examination of witnesses

Witnesses: Professor Bryan Charleston and Professor Sir Peter Horby.

Q1 **Chair:** The Science, Innovation and Technology Committee is in session, and today we start our oral hearings for an inquiry looking at emerging diseases and the lessons that we should have learned from covid-19 for our approach to those diseases.

We are pleased today to welcome some distinguished witnesses, starting with Professor Sir Peter Horby, professor of emerging infections and global health at the University of Oxford and director of the Pandemic Sciences Institute at that university as well as being executive director of the International Severe Acute Respiratory and Emerging Infections Consortium. Sir Peter is the co-chief investigator of the Recovery trial of treatments for covid-19 and viral pneumonia.

With him is Professor Bryan Charleston, who is the director and chief executive officer of the Pirbright Institute. He is a veterinary viral immunologist and an expert in host-pathogen interactions related to major viral diseases, with particular interest and expertise in those that affect livestock. Thank you both very much indeed for coming.

Perhaps I could begin with a question to Sir Peter. Given your long-standing study and knowledge of the area, why should we be concerned about diseases in animals and their potential transmission to humans? Are they a particularly worrisome source of disease?

Professor Sir Peter Horby: Yes, they are. Emerging infections are new infections that either come into human populations afresh or change their geographic distribution or behaviour, so they are more severe. Most of those emerging infections originate in wildlife sources and they emerge because they are novel viruses; we have no immunity to them, so they spread quickly and cause new diseases and syndromes. It is hard to estimate, but it is estimated that at least 70% of all emerging infections come from wildlife. There is a huge diversity of viruses in wildlife, most of which we do not know about. There are an estimated 300,000-plus viruses that are unknown to us in mammalian species. All of those risk a threat of transmitting to us, causing epidemics but also pandemics if they spread efficiently.

Q2 **Chair:** When it came to covid I think I am right in saying that it was our many years—decades—of research into some of the potential diseases, or the viruses, that was the platform from which we could rapidly respond. Is that right?

Professor Sir Peter Horby: Yes. Since SARS-1 in 2003 we knew that coronaviruses could cause severe disease. We dodged a bullet with SARS-1, which was close to being a pandemic then. There had been quite a lot of research, although not as much as there should have been, to be honest, particularly around therapeutics. There had been vaccine development and that had been further stimulated by the middle east

respiratory syndrome coronavirus that comes from camels. There were candidate vaccines that were at a stage that could be accelerated into vaccination. On the other hand, there had not been advances in diagnostics, so it took us a long time to catch up on that, and there had not been advances in therapeutics, so it took us a long time to catch up with specific antivirals for the coronaviruses, even though we knew they were a major threat.

Q3 **Chair:** Thank you. Obviously, during the pandemic, you were actively involved in accelerating that response. I was concerned by some reflections from you, a while ago now at the end of 2022, when you considered that there had been, as you put it, a "loss of momentum" in our arrangements, some of which were novel and brought about in response to covid. You had concerns, as you put it, that there was "a return to business as usual", which "doesn't necessarily mean it's good business". The Committee is looking for lessons from covid, so would you perhaps unpack that? What did you mean, and does it still apply?

Professor Sir Peter Horby: The UK really knocked it out of the park in the science response. We developed one of the most affordable and widely used vaccines, particularly for low and middle-income countries. We basically wrote the book in terms of treatments for covid-19. We had COG-UK, the genomic surveillance, which was world leading. People around the world hung upon the results of its analysis. We did brilliantly, but a lot of that stuff has now been dismantled. COG-UK and Recovery are no longer funded. You will probably hear about the vaccines work; the vaccines manufacturing facility was sold and is now mothballed. A lot of that capability has not had strategic investment to keep it going.

Although when we had the G7 leadership the 100 days mission was a fantastic ambition, I have not seen it translated into a real road map or concrete milestones and deliverables. I was just reading the new strategy, and a great example is the table on high-level strategy implementation. "Develop and evaluate…vaccines, therapeutics and diagnostics" is a long-term aim. It should not be a long-term aim, but a short-term aim. We have the capabilities and understand the threats. It should be one of the first things we do.

Q4 **Chair:** On that point, the 100 days mission was specifically to be able to respond within 100 days of a new threat or outbreak being recognised. The implication is that that ambition has been abandoned, is it not?

Professor Sir Peter Horby: Yes. To be able to implement the 100 days you are going to have to have done several years of work, so a new strategy that makes diagnostics, vaccines and therapeutics a long-term aim is quite disappointing. There is a dissonance between what is being said in the 100 days mission, and what is being done.

Q5 **Chair:** The Recovery trial, in which you played the leading role, was commended around the world for making use of the asset that we have in the NHS for the benefit of patients here and around the world. Is there an

explanation for why this is not being built on but is being defunded?

Professor Sir Peter Horby: The background is that we had some block funding. We were highly efficient—100 times cheaper than a pharma trial—so we were underspent, and the NIHR asked for its money back. It is partly a fiscal issue, I think. There were a lot of competing priorities such as getting other trials back up and running in non-communicable diseases. That is a clear priority, but to disinvest from something that is being sold as a jewel in the crown seems a bit perverse.

Secondly, there was a desire to return to normal competitive business, and it is perhaps seen as anti-competitive in the grant funding area to keep funding something that has been successful. Again, that is a bit perverse. If it is successful, keep funding it: but other groups would say that that is anti-competitive and that they have no access to funding.

Q6 **Chair:** Which groups would say that?

Professor Sir Peter Horby: I think other research groups would say, "If you keep just funding the trials that have been successful, where is our opportunity to develop our research?"

Q7 **Chair:** You have been involved in medical research all your career. Continuing to fund areas of research that are productive seems to me a pretty good strategy.

Professor Sir Peter Horby: You would think so, but I just came back a few days ago from Cameroon, where we were having an annual meeting with our Africa network, which is nine countries across sub-Saharan Africa, on emerging infections research; it is coming to the end of its funding and EDCTP3 has not put forward any funding calls to sustain those networks. We asked why and they said, "Because it would be seen as anti-competitive." So a very successful consortium was working on emerging infections in an area that is one of the most highly prone to epidemic infections in the world, and there is no opportunity for refunding it.

Q8 **Chair:** Who is the "they" in this context, Sir Peter? Who makes the judgment that it is anti-competitive?

Professor Sir Peter Horby: This is EDCTP funding, which is the European and Developing Countries Clinical Trials Partnership. It is something in the EU where the UK is still kind of a partner in the programme. They fund clinical research, mostly in Africa. That board decided that to refund a successful network would be seen as anti-competitive.

Q9 **Chair:** My colleagues have some questions, but this is very important for learning the lessons of covid. You mentioned the vaccine manufacturing centre that has been sold and, I think, mothballed. Give us your perspective on that decision. The implication was that you did not think it was the right one.

Professor Sir Peter Horby: I think it reflects an apparent lack of cross-Government strategy in this area, because that vaccine manufacturing capability was developed post the Ebola outbreak in west Africa, with the realisation that we needed domestic vaccine capabilities. Again, probably for fiscal reasons, it was sold, and the company that it was sold to decided to mothball it. There was a short-termism around what was meant to be a strategic investment.

Q10 **Chair:** Finally, you and your colleagues in your institute have been instrumental in the covid response, but, as its name implies, the Pandemic Sciences Institute is there to help us build on that, and prepare for the future. I read that the previous Prime Minister, Boris Johnson, made a commitment to your previous Vice-Chancellor Dame Louise Richardson for central Government funding to the tune of, I think, £150 million. What is the status of that at the moment?

Professor Sir Peter Horby: It has disappeared into the ether. There has been no Government funding of the institute at all. We get some competitive grants, but actually most of the funding is now philanthropic.

Q11 **Chair:** So the centre that was established to capitalise on our demonstrated and world-celebrated expertise is not in receipt of any direct Government funding.

Professor Sir Peter Horby: Correct.

Q12 **Chair:** Was it your understanding that the previous Prime Minister made a commitment to the previous vice-chancellor?

Professor Sir Peter Horby: Yes. I was not present, but from talking to the vice-chancellor and others who were present, there was a direct commitment. Oxford had made a big contribution to the vaccine and therapeutic trials and other areas, and we had put forward the setting up of an institute to take forward that learning to help to mitigate the risk of future pandemics. There was a verbal commitment from Boris Johnson to fund that, and it has not been funded.

Q13 **Chair:** What is the consequence of that? You run the institute. How do you manage?

Professor Sir Peter Horby: The consequence is that I am running the Pandemic Sciences Institute out of a portakabin and we are raising money from philanthropy. We are successfully doing that and are going to construct a new building, but it is entirely financed by philanthropy.

Chair: Thank you very much, Sir Peter. I am sorry to hog so many questions. My colleagues have some, but it was important to get your steer on that, in an inquiry that is very much about learning the lessons and making sure we can advance. I am going to turn to my colleagues, starting with Dawn Butler.

Q14 **Dawn Butler:** Thank you very much for your evidence, which was quite fascinating. I want quickly to pick up on domestic vaccine capabilities

with both of you. For people watching the session now or on catch-up, why is it so important that we have domestic vaccine capabilities in the UK?

Professor Sir Peter Horby: I am a human health person and Bryan is on the animal health side, but from our perspective you can see that it was vaccines that changed the game. There has been a lot of controversy around the non-pharmaceutical interventions, the lockdowns and the huge economic burden, and it was really vaccines that got us out of that. We were lucky that the virus was not that difficult to make a vaccine for. It may be much harder. Look at HIV vaccines; there still aren't any very effective ones. So you have to do that R&D over 10 years to be able to get to the stage where you could do it. You need to invest in R&D and make sure you onshore it. Then, when there is a crisis, you can see that there is huge competition for resource. If you look at diagnostic labs, vaccine manufacture and even filling vaccine vials, you cannot get the vials and the reagents, because the countries where production is happening retain them nationally. For national capability and resilience, if you do not onshore production, you are putting yourself at huge risk that in a crisis you will not have access to the materials that you need.

Dawn Butler: Professor Charleston.

Professor Charleston: We are in a slightly happier place in terms of vaccine development. We are in the same position with regard to vaccine manufacturing. In contrast to the mothballing of VMIC, we received substantial funding last year from the UK Government—the BBSRC and FCDO—and the Gates Foundation, to develop a centre for veterinary vaccine innovation and manufacturing. That is the same model, and it was supposed to partner with VMIC, to be the animal health side. It is now established at Pirbright for the same role—to develop and explore novel vaccine platforms that could be used in animal and human health. They transfer relatively easily. That is great.

You have a really strong R&D base. There is now the investment—acknowledgment from people like the Gates Foundation that it could have put the facility anywhere in the world but decided to put it in the UK because of that strength in R&D capability and the development of vaccines. When we produce a vaccine and have a system and process in place to produce it, we have to go abroad. There is no UK partner of any substance to partner with, so we see our really novel ideas—IP protected—going to multinationals.

Q15 **Dawn Butler:** And that puts us at risk.

Professor Charleston: It puts us at risk, of course, for the reason that, as Peter has just said, when there is a pandemic everyone wants to resource their own country's requirements—so yes. There is also the longer-term drain on the intellectual discoveries of our research. The real money that is made from the discoveries goes abroad.

Q16 **Dawn Butler:** Right. Thank you very much. Just to finish and come full

circle on that, would you say it is important that we in the UK take control of our IP and make sure that it stays with us and is Government-funded—that it does not go elsewhere to other companies?

Professor Charleston: I do not understand why we have lost all our veterinary vaccine manufacturing capability. There used to be considerable capability in the UK—in Milton Keynes and Sandwich, etc. These companies have all left. I am not going to give details, because of company confidentiality, but I have been apprised by one of the companies of the fact that it would like to invest in manufacturing in the UK, or to find a way to do it. I have tried very hard to speak to people in Government, but I do not know whom to speak to about this.

Q17 **Dawn Butler:** I am sure the Chair will make that easier going forward. Thank you. We will pick that up as a Committee.

Peter, you talked about 300,000 animal viruses that are unknown. Obviously respiratory viruses are most concerning, given the way they spread in the air. Are there any other specific viruses that have global public and animal health implications?

Professor Charleston: It is right that there are a large number of viruses. A good place for that is the UK vaccine network, which is chaired by Chris Whitty, and the WHO. How do you make sense of that and prepare for the potential emergence of a virus out of the myriad that exist? Viruses are in families with specific characteristics. There are not so many families. By taking an exemplar of a family and getting a vaccine that would work for that family—which is what happened with coronaviruses—you are prepared and can get the diagnostic capability as well. That is an excellent way of breaking down something that it seems you cannot grasp, into families.

With coronaviruses there are decades of research on veterinary vaccines. Coronaviruses are a huge problem in veterinary medicine. One of the most economically important poultry diseases is a coronavirus that causes respiratory disease, so the years of understanding of coronaviruses and how to drive immunity were also really helpful in developing the vaccines. Similarly, lessons can be learned from studying animal viruses. They are the same families. You can transfer that information to human vaccines.

We have great relationships with the people in Oxford, such as Andy Pollard. We have worked together for many years looking at vaccine platforms and understanding the immune response to those vaccines. That underpinning knowledge is one way to get the information to a state of readiness so that you can respond in an emergency. In summary, it is a matter of driving that "One Health" discussion and getting people in the medical field and the animal and human health fields working and talking together and sharing knowledge about transmission, etc.

Q18 **Dawn Butler:** Thank you. We have received a lot of evidence that says that the source of the next pandemic will probably be animal diseases. Do

you agree, Professor Charleston?

Professor Charleston: That is the history. There are many examples. You are obviously aware of the SARS-CoV-2 pandemic, but there were two other coronavirus pandemics in the last decade where the virus jumped from wildlife to pigs and spread around the world. Coronaviruses jump very easily between species. Some viruses have a tendency to do so, and some do not. I think it is very likely. Nipah virus is another one. It jumped from bats to pigs and into humans. It is certainly something that should be very high on the radar.

Q19 **Dawn Butler:** This is my last question, Chair. What advances and investment would you like to be made in therapeutics?

Professor Charleston: Therapeutics, I think, is really for my medical friends. We do not really use therapeutics in that way. Antivirals are not really cost-effective. It is really diagnostics and vaccines that we focus on, but I am sure Peter will have something to say.

Professor Sir Peter Horby: Yes, I completely agree with Bryan about human health and animal health, but I would also add that we always have to be vigilant not to fight the last war. Yes, respiratory pathogens are the most likely to cause a pandemic, but there are other pathogens. One has to look for, say, enteric—gastrointestinal—viruses like polio. There is a whole range of viruses in that class. You might see the emergence of another polio-type virus. Then children are affected, and it is much more complicated because of the long-term outcomes.

Therapeutics is really interesting. I think monoclonal antibodies—artificial antibodies—came of age in SARS-CoV-2. They were developed and used largely for chronic diseases and cancers, but we have now seen that they are an excellent platform for treating infections. They are a very safe humanised platform, and you can sort of plug and play different pathogens on to them. They have proved to be very effective. We should be looking at taking forward the monoclonals. In the UK we are very good at identifying the targets for the monoclonal antibodies, but we are not good at taking that through to commercialise it. Most of the commercial antibodies that are now used in SARS-CoV-2 are not made by UK-based companies. We are doing a lot of the early-stage stuff; and we are doing the late-stage stuff—we evaluated them in the Recovery trial—but a lot of the middle bit of commercial development, commercialisation and scale-up is sometimes missing in the UK.

Then there are small molecule antivirals. They are not artificial antibodies but classic-type drugs. They are good because they are more generic. The monoclonals are very specific. We have seen resistance developing to the monoclonal antibodies—you have to renew it for a new variant—whereas the small molecules tend to be less likely to get resistance; but they require even longer-term investment. It is not "plug and play". You have to find a new molecule for each one.

Dawn Butler: Thank you both very much.

Q20 **Carol Monaghan:** Thanks, Chair. Professor Horby, what are the main drivers of disease emergence? Is there any evidence that different drivers may interact with each other?

Professor Sir Peter Horby: It is very complicated. We live in a complex ecosystem and we influence it in a complex way. There are definitely anthropogenic—human-driven—factors that are key. Given the fact that most of the emerging infections come from wildlife, the interaction between humans and wildlife and how we disrupt the ecology of the wildlife is very important. That increases the risk of spillover from wildlife species either directly to humans, as is seen with viral haemorrhagic fevers such as Ebola, or through intermediate amplifying hosts such as livestock, as we saw with Nipah and pigs. The industrial development of livestock is also a risk because there are large populations in which the virus can spread, adapting into the population and spreading to humans.

The next stage is spillover and some amplification in humans. Then we have increasing population density. In parts of Africa where a few people might have been affected in a village, they are now in a big town, so there is a much bigger human population for adaptation. There is also increased connectivity. Most of the world is very highly connected. Many of you may have seen the maps of global connectivity, and that has been changing dramatically. I was in Cameroon last week and Senegal the week before. People can move around the world so easily and international spread is very quick. It is a complex ecosystem. There is climate change and mosquito climate suitability. All those things push in the direction of increased risk of emergence.

Q21 **Carol Monaghan:** In looking at risk, or trying to mitigate risk, is there a particular driver that we should focus on, or are the things that you are talking about—population density, spillover into different environments—beyond our control?

Professor Sir Peter Horby: It is not my area of expertise, but I think it is very challenging. To influence complex human systems and ecologies is very challenging. One area with potential for intervention is the interface between wildlife and farmed animals, which Bryan can say a lot more about. The biosecurity around farmed animals, which are often a reservoir and amplifier of viruses, is something that can be addressed.

Q22 **Carol Monaghan:** Thank you. Professor Charleston, I know that livestock is your expertise, but I want to talk about insects, and perhaps you can give us some thoughts on the subject. We certainly see insects in the UK that we would not have seen before. Two weeks ago my daughter had to go to hospital because of a mozzie bite, in Glasgow, which would never have happened before. How should we go about preventing the spread of rare diseases caused by insects? Are we doing enough to mitigate the risk?

Professor Charleston: We do a lot with insects. We have the largest insectary in the country at the Pirbright, for that reason—so that we can follow the transmission and understand. There are, broadly, two things. The insect vectors will move and increase the range of their habitat, because of climate change. We see that, from the European perspective. Insects are spreading north, and the viruses that they carry tend to follow. Alternatively, there are examples, such as bluetongue virus, which we had in 2007, that are brought in by some other route, where the vectors that we have are competent for those viruses. We need to understand two things—the spread and the increased risk of getting those viral infections, because of the slow march north of the vectors. We also do a lot of work to understand whether the vectors that we have in the UK are able to spread the viruses that we are worried about. That is an important piece of work, too, and a very important part of the risk assessment.

To jump off at a bit of a tangent to animal species, one of the viruses that we do not want in the country is African horse sickness. It has 80% mortality. It could be spread by the midge that we have in the UK. We need that awareness, in terms of the risk assessment. Then you can start looking at the work of trying to prevent the degree of challenge that an animal or individual will receive from those insects—those sort of preventive measures.

Q23 **Carol Monaghan:** Can I take you back to that point? I would call them midgies, but I am from Scotland. That is a native insect, but there is a risk that it can spread a new emerging disease into the UK.

Professor Charleston: That is historically what happened with bluetongue virus, which, essentially, was restricted largely to Africa. It is in other areas as well, but that is its closest proximity to us. It was brought into Europe and could be spread.

Q24 **Carol Monaghan:** Is that a slow spread, with insects, or was it through livestock?

Professor Charleston: There are two. There are both scenarios with bluetongue. There is a slow spread north through climate change, but there was also an event where the virus was deposited in Benelux, and, from there, there was an outbreak, which eventually spread into the UK in 2007. Fortunately, DEFRA implemented a vaccination campaign very quickly, so the UK is free, whereas in Europe it is still endemic.

Q25 **Carol Monaghan:** You have given us one example of risk. Are there any other examples of diseases that would not normally be found in the UK becoming established because of this?

Professor Charleston: This is more Peter's field, but you would be worried about the arthropod-borne viruses, such as dengue and Zika. There is the potential for those viruses to become established in the UK.

Carol Monaghan: Professor Horby, do you want to comment on that?

Professor Sir Peter Horby: We are seeing dengue, which is classically a South American and south-east Asian disease that is hyper-endemic in those countries, spreading north. You are now seeing transmission in the Mediterranean and that is gradually spreading north. Climate change does spread vector-borne diseases because it increases the range of these vectors.

Q26 **Carol Monaghan:** Are we responding to this spread in an appropriate manner?

Professor Sir Peter Horby: It is not my area of expertise, but I know that within the UKHSA there is an entomology group that is very active in doing surveillance of mosquitoes and ticks in particular. It is doing community publicity particularly around some of the tick-borne diseases.

Q27 **Stephen Metcalfe:** Going off at a slight tangent, I think it is established that another way of diseases getting into the wider community is potentially through lab leaks. I would be interested in your view on how concerned we should be about that. I believe the 2007 outbreak of foot and mouth was from a lab leak. First, is it something about which we should be seriously concerned? Secondly, if it is something we should be concerned about, do we need tighter regulation of the way pathogens are handled within labs?

Professor Charleston: I can take that as I lived through the 2007 slightly bizarre situation and the publicity, as well as trying to control an outbreak. In response to that, there has been huge investment in those labs to make sure they are secure. As for infrastructure, we have had a £300 million investment from the UK Government to build state-of-the-art facilities so that those viruses will not get out, but that is not all that is required. There is huge investment in trained staff and maintaining those facilities. Our annual budget to switch the lights on is about £15 million per year. These are very sophisticated buildings.

The biological sector was a little bit behind other high-hazard sectors. I think we are catching up rapidly with help from HSE. Again, I support what HSE is doing in this space. It encouraged us to form a bio-risks strategic leadership group to bring together DSTL, UKHSA, Imperial, Oxford and Cambridge on how to manage risk. I think the UK is now in a much stronger position. We have very strong links with those other high-hazard infrastructures: oil and gas, chemicals and explosives. We had a visit from the safety team at AWE—Aldermaston—last week at Pirbright on best practice.

I think the UK is in a good place in terms of biological safety. What we are getting a huge demand for and was the reason I set up a dedicated training team, which is just scratching the surface, is an international realisation that there is not enough trained staff to run these facilities. There is funding from the Canadian Government. They are supporting us and people at DSTL to try to work internationally.

If I simplify this, I think funders want to address the situation where they invest in the capital to build high-containment labs. They will go back to those labs a few years later and they are not functioning. That is because there is insufficient trained staff to run those facilities. We do a number of twinning projects around the world, driven initially by the transfer of scientific knowledge. We very quickly get into how we control the bio-risk on this site. How do we have quality assurance standards? They want to know how to run a lab. That is a big piece of work funded by the Canadian Government related to threat reduction programmes, because you could have the malicious or accidental release of pathogens from these labs internationally. That is a big problem internationally.

Q28 **Stephen Metcalfe:** Just to summarise it—correct me—is what you are saying that the chance of something leaking from a lab in the UK is pretty slim now because of the changes, but internationally we should be concerned?

Professor Charleston: You never want to say this because you do not know what will happen tomorrow, but I think we are in a much better place. As the HSE says to us, one should be in a constant state of unease, as we are, but those structures are much more robust and the funding we have had to build and run that laboratory is, I think, adequate.

Professor Sir Peter Horby: On the human health side, high-containment laboratories are absolutely essential. You cannot diagnose the disease, you cannot evaluate the diagnostic test, you cannot understand the disease pathogenesis, and you cannot evaluate the therapeutics, vaccines and animal models unless you have high-containment facilities to do that. There are mitigations you can do; you can use artificially constructed versions that are inactivated, etc. But at some point you really have to work with the live virus.

On the human health side, there is a lack of capacity in the UK. The infrastructure at Porton Down is crumbling—the UKHSA—and there has been talk of moving that to a new facility at Harwell for more than a decade, with a new national Public Health Agency category 4 lab there. As far as I can tell, there has still been no movement.

You have DSTL—Defence Sciences—unit labs there, which are great, but what we do lack in the UK is easy access for academics to CL4 capacity—

Q29 **Stephen Metcalfe:** Did you say category 4?

Professor Sir Peter Horby: Containment level 4 is the highest containment and is what happens at Porton Down and Colindale. That is academic access. A lot of the innovation and research is driven by academics because they have the time. We sometimes find it very difficult to access the public health laboratories because they are understaffed, overwhelmed and are responding to a public health emergency and experiments get put back. We very often use US labs and

do studies in the US, or in European academic labs like Lyon, because we do not have that capability here.

Q30 **Stephen Metcalfe:** As for updating or moving Porton Down, what sort of financial investment are we looking at?

Professor Charleston: I don't know.

Professor Sir Peter Horby: It is substantial, but moving that facility to a new one in Harwell has been talked about for a very long time.

Professor Charleston: You are talking about £1 billion-plus to build a lab of the quality and size that would be expected. To some extent, we are an observer of what is going on, but there is a real need for a joined-up approach across Government to identify what CL3 space is required and where it should be placed. You do not want two or three of these; you want one of the right size properly built and staffed. They are not easy to run.

Q31 **Stephen Metcalfe:** That point is well made and will be on the record. Peter, my final follow-up question is about how concerned we should be about pathogens escaping from a lab, whether here or internationally, and whether we need—this is my suggestion—some kind of international framework about how pathogens are handled. Do we need to tighten up those international standards about how they are handled to make sure they do not leak from labs?

Professor Sir Peter Horby: It is a real risk. There have been instances of lab leaks on the animal health side and in human health, so it is a very real risk. You need the capability, but you need to make sure you manage the risk properly. In the UK we have pretty stringent rules with the HSA and various other regulations about handling this. Sometimes they are over-onerous. We had real difficulty with monkeypox. It is still being categorised at a level it should not have been.

There ought to be an international standard about how these pathogens are handled, and probably different countries have different categorisations of what is and is not hazardous. It is not always easy. For example, does a country like the Democratic Republic of Congo, which sees Ebola outbreaks all the time, need to handle it as a category 4 as you might do in other countries? One would imagine this might be a task for the WHO to set an international standard that people will be asked to follow.

Q32 **Rebecca Long Bailey:** You have both already mentioned the need for a review of lab space capability in relation to Stephen's previous questions. You have also mentioned the short-termism of the Government's current vaccine manufacturing strategy. Are there any other UK policies, such as the pandemic preparedness strategy or biological security strategy, that sufficiently cover all potential forms of a future pandemic? If not, what areas do you think the Government should improve on?

Professor Sir Peter Horby: In our written evidence I talked about the need for a coherent scientific strategy, and a biological security strategy came out just yesterday. It is a step in the right direction and is the closest thing to a coherent strategy because it covers many bases. Perhaps it tries to cover too much because it also covers antimicrobial resistance and invasive species, so you risk casting the net too wide and making it difficult to implement.

Having read it just this morning, I do have concerns that it is generic, looking at some of the recommendations, for example, around the 100 days mission, of having diagnostics critically in place in 100 days. If you cannot diagnose it, you cannot treat it and you cannot develop therapeutic vaccines. It just talks about that as a long-term aim. One of the objectives—I think it is 14—is, "We will explore how to support the delivery of the 100 days mission." That is it. That is just not enough. It needs to be much more concrete in terms of not just exploring it but how you will deliver it. What are the milestones? What investment is needed? What are the priorities? Who is accountable for it?

One good thing in this is that there is an accountability framework. Senior responsible officers are named so it is a step in the right direction, but it just does not have the granularity that it needs.

Professor Charleston: I think about this differently. Rather than focusing on pandemic preparedness, we have responsibility as the UK's laboratory response to foot and mouth disease, African swine fever and African horse sickness. The way we try to make sure we are fully prepared on a lab site is that we are also the world reference laboratory for a number of those diseases. We have a big international footprint. Every day we are testing samples from around the world for those pathogens. That machine is running every day.

I have examples. When there was a suspected foot and mouth outbreak in Norfolk recently, within a number of hours we could let the CVO know with certainty that that was not the foot and mouth disease virus and it did not need to set up exclusion zones and so on. I do not think you can have dusty pieces of equipment sitting in the corner that you fire up in a pandemic. It is like vaccine manufacturing and the international presence in helping to control diseases around the world, which I think the UK is very good at and I think we should invest more in. This is an opportunity for the UK to have a real presence internationally in disease control.

I have already described offering training to people, exchange visits and so on. You know what is out there; you know what is coming; you know what is spreading in different parts of the world; you know that your diagnostic tests will pick it up, and you are ready for it. Similarly, even though we do not have a manufacturing facility, you could be producing vaccines if you had seen viruses emerge in another part of the world.

For me, it is a real oddity that we have this tremendous research and development base, as Peter has already highlighted. We knocked it out

the park, your term, with SARS-CoV-2 and our response, yet we do not have the infrastructure to translate that knowledge into real impact. We are very good at it. That is the way you do pandemic preparedness. You have that motor running all the time.

Q33 **Rebecca Long Bailey:** You mentioned the international response and co-operation, which is quite positive at the moment. Is there anything you think that internationally we can improve on in pandemic preparedness? Do you think that domestic policies within the UK effectively contribute to this international picture at the moment, or do we need to do more, Professor Charleston?

Professor Charleston: The biggest area of co-operation is sharing knowledge of the pathogens out there and generally that is very good. There are some countries we struggle with. On the whole, it works well. International agencies, certainly on the animal side—WOAH and FAO—work very well to get that transfer of information. That is a good thing. The availability not of therapeutics but of vaccines and control measures in countries that desperately need them is quite woeful. We had visits from senior people in Nigeria. It is a really difficult situation. They cannot apply what are in other countries readily available vaccines to control disease.

Professor Sir Peter Horby: The international dimension is absolutely critical. If we are just looking at onshore capabilities, you are talking about epidemic control. Pandemic is global; you want to stop it where it emerges. It is unlikely to emerge here; it is much more likely to emerge overseas. So that international dimension is important.

There is obviously the political division and engagement with international agencies like WHO, but critically there are peer-to-peer relationships. We have very good relationships with people in China. On 2 January I was personally talking to people in Wuhan. That allows you to work below the political radar sometimes, get a lot of intelligence and collaboration and start to build partnerships with affected countries. That is great. There has recently been an accord between the UKRI and the Chinese Ministry of Science and Technology for UK-Chinese scientific collaboration. Those types of initiatives are good because they foster those trusted networks internationally, which are really important. Sometimes when the politics is very difficult, those peer-to-peer relationships developed over decades will remain strong and can be really helpful.

Chair: Can I thank Sir Peter and Professor Charleston for their evidence today? It is very important in kicking off this inquiry. We are very grateful for the work that they did in the years leading up to the pandemic, which had such a big impact, and the vigilance that Professor Charleston's work has given to this country.

Examination of witnesses

Witnesses: Professor Nicola Lewis and Professor James Wood.

Q34 **Chair:** I will ask our next pair of witnesses to join us at the table and, as they do, I will introduce them. Professor Nicola Lewis is an expert in influenza research and surveillance. She is director of the Worldwide Influenza Centre at the Francis Crick Institute. She is also a member of the UN's swine influenza virus group. Joining her today is Professor James Wood, head of the Cambridge Veterinary School. Professor Wood's research interests are in emerging zoonotic infectious diseases, especially bat-transmitted viruses in sub-Saharan Africa, bovine TB and avian influenza, all very relevant to our inquiries today.

Starting with you, Professor Lewis, perhaps you could say something about the gaps or weaknesses in the current international surveillance of emerging diseases, whether in humans or animals.

Professor Lewis: What we can do is reflect on one of the successes that was part of the covid-19 pandemic. We have a global influenza response system which was set up in 1952. This is a global network of laboratories co-ordinated by WHO. What the GISRS network allowed us to do during covid times was leverage the national expertise and diagnostics at the national influenza centres and switch it across to covid-19. One of the powerful things we have are these international networks that are already in place.

When we are thinking about gaps that we might have, we need to look at the networks we already have, both on the animal health and human health side, and identify where they could be strengthened. Listening to the previous experts speak, I can reflect on the fact that a lot of this capacity building and strengthening can come from the existing international partnerships that we have. For example, I am director of WHO collaborating centre at the Francis Crick. We partner with over 90 countries—90 national influenza centres worldwide. We take receipt of their seasonal influenza viruses and any influenza viruses detected in humans that have spilt over from animal populations. Building these trusted partnerships over time, in this case over decades, allows us to strengthen capacity. We can bring in these experts from national influenza centres to undertake training with us, and then they can go back and employ the new techniques that they have.

Similar networks run on the animal health side. When you are thinking about pandemic preparedness and the kind of surveillance intelligence that you need for viruses likely to be circulating in animal populations and that have the potential to spread to the human population, linking both the surveillance networks on the animal sector side closely with the public health sector side at national, subnational and regional level is absolutely critical. This is a huge gap in what we can currently manage to do not only within the UK but on the international stage.

Chair: Professor Wood, do you have anything to add in your purview of the international arrangements?

Professor Wood: Professor Lewis has given a very clear exposition of the strength of the international surveillance system. One very important point is that surveillance does not work unless you have detection in the first place. You have heard from Professor Charleston and Sir Peter about the importance of having established systems in place. We have a belief generally that if something is nasty, we are going to find it. The challenge for surveillance of emerging pathogens with pandemic potential is that many nasty things are not detected in many parts of the world. My colleagues in Cambridge have published the fact that of those initial spillover events of an animal pathogen to humans—one of the best recognised ones is Ebola—it is estimated that 90% were missed in Ebola-endemic regions where it is a well-recognised disease.

Q35 **Chair:** Because of a lack of initial detection.

Professor Wood: It is lack of laboratory capacity on the ground and lack of primary healthcare. Great though the international health regulations are, that is where reliance on them, which effectively delivers a parachuted response on the ground, cannot work unless you get early detection.

Chair: That takes us to some questions that we have on those international arrangements. I turn to my colleagues, starting with Dawn Butler.

Q36 **Dawn Butler:** Professor Wood, you just said that if there is something nasty, we will find it. How early do you think you would be able to find it and feasibly respond to it?

Professor Wood: A lot of the international pandemic response work around the pandemic treaty is based on the idea that if it is there, we will find it. When you look carefully at the evidence, the systems are not in place to find things until they have turned into an outbreak. As we have seen in Wuhan, by the time you have an outbreak, for the reasons Sir Peter described earlier, you have the very rapid transmission of something. If it can transmit, it will do so very rapidly around the world. We saw that with swine flu coming from Mexico in 2000 and we have seen it with SARS-CoV-2. When something can transmit it does, and it does so globally very quickly. We should have real concern about our ability to detect and respond in a meaningful way to the next pandemic.

Dawn Butler: Professor Lewis, do you agree?

Professor Lewis: I completely concur. One of the things we could do is take the priority diseases and make sure we have efficacious detection methods for the viruses that we can currently detect out there and then work actively with our international partners to ensure, through quality assurance schemes and even through training, that they can deploy those tests in the settings they need to. Context is very important. These viruses circulate in animal populations and people live with their animal populations in a variety of different ways. It is very important that we have efficacious diagnostics as close as possible to the animal source,

and that the local community healthcare services are also empowered so you have both sides of the fence covered, with near real-time diagnostics and near real-time deployment of sequencing perhaps as close as possible to pen side or bedside as we can get it. That is true in the UK, if we were to have an emergent event introduced here; it is true of our own healthcare systems and our own animal healthcare systems, but it is very much true of the international healthcare and animal welfare systems too.

Q37 **Dawn Butler:** If we were to recover some of the money that has been lost to fraud from the pandemic, say £2 billion, what would you prioritise in regard to surveillance projects?

Professor Lewis: The surveillance system design depends on the question that you are asking. That also depends on the context in which you are asking it. It also depends on you ensuring a priori that there is a decision-making process aligned with what you are going to do if you find something in your surveillance system. That is true of both the animal health side and public health side.

To take your question, if we are to look at emerging infectious diseases in a particular country overseas, we would want to support risk-based surveillance system design and building capacity on the veterinary and public health sides at a level of statistical power to address the reasons for doing that surveillance in the first place, and then work with the local stakeholders so that, if a particular virus were detected and spilled over into a particular community, the policy and risk mitigation steps are already in place and all stakeholders have had that clearly communicated to them. There is a whole framework we need to work with, with local stakeholders, if this is overseas, but this is also true of steps we need to take within the UK surveillance system.

Q38 **Dawn Butler:** You would build capacity for your interaction globally or internationally; that is where you would invest.

Professor Lewis: Yes. We need to do two things. We need to invest within UK plc along similar lines, but if we are looking at the international side of things for exotic threat detection, we need this whole spectrum of work to be done. We also need to identify potentially risky interfaces. As Sir Peter said earlier, that requires research to be undertaken perhaps to risk map areas where we can predict from previous outbreaks that there might be a higher risk of spillover. We need to take this as a holistic framework of engagement rather than just silo it up a little bit. That is the way we are going to be able to deliver impact, which is what we want to do on the international stage with our partners.

Dawn Butler: Professor Wood, do you want to jump in?

Professor Wood: I would like to recount a meeting that Professor Cunningham—from whom you are about to hear—and I had with the director of public health in Ghana following some research we did where we demonstrated for the first time that there was evidence of Marburg in

the bats in Ghana. This very senior gentleman in the Ghana health service looked at us and said, "What do you expect me to do about it?" Marburg is obviously a disease of international importance of general pandemic concern, similar to Ebola. He said, "I have all of these problems with malaria, TB and HIV. I don't have enough resource to deal with them. You're talking about a disease where there have been no cases detected in humans in Ghana, so I ask you: what do you want me to do about it?"

We have to be very careful when we are thinking about spending money, which is needed, in terms of whose priorities we are talking about. My strong belief—I see very clear evidence of this in the UK where I spent a lot of time working with APHA on bovine TB and other diseases such as avian influenza—is that you need very strong local surveillance based on good primary health, both veterinary and medical care, in order to have early detection so you can have early response. Supporting other countries in that way, as we do through some of our overseas aid, is really important, but it is a long-term political measure in a way rather than just thinking, "We're going to solve your pandemic problem." We have to think about this as our pandemic problem and support endemic disease structures, as has been described for the UK by all the other speakers this morning, to set you up to be able to respond to any emerging threat. I believe that is what is missing at the moment globally.

Professor Lewis: We work regionally through WHO. There are initiatives at regional level to allow member states and regions to prioritise according to their own situation. For example, if we work with the east Mediterranean and north Africa, they do not see SARS-CoV-2 as a particularly high priority currently. They do see MERS virus surveillance as a priority. I completely agree with Professor Wood that we need to nuance this by the priorities of the countries with whom we are partnering and not impose directly from outside.

Q39 **Carol Monaghan:** Professor Wood, what are the specific challenges associated with surveillance methods if we are looking at the spread of zoonotic diseases within the UK?

Professor Wood: You know about the benefits of the "One Health" approach looking at integrated surveillance of diseases that cross human and animal boundaries. We are relatively joined up in an informal sense, but we have separate surveillance systems in animals and humans. I think the drive towards integrating them is important and would be timely now.

Q40 **Carol Monaghan:** You are saying that it is an informal set-up just now. Do we need to establish more formal means of communication and possibly networks?

Professor Wood: That work happens already through a joint committee between DEFRA and the Department of Health and other Government Ministries, but the systems themselves are separate. Genomics provides

great opportunities for having an integrated approach. If it is diagnosed in animals, it should be immediately evident and reported across the Department of Health, and generally for serious infections I think we can rely on that happening very effectively because there is good integration between the systems that we currently have. There is an imbalance in laboratory capacity between APHA, which is our primary agency for delivering this, and UKHSA on the other side of things. It is not that the animals are much worse off than humans, but the investment that has been put into the site at APHA is critically important in bringing those standards up to scratch. I cannot speak for the quality or challenges around UKHSA at all.

I think the biggest challenge for an emerging pathogen, in contrast to some of the ones we are talking about, is that we do not know what to look for. We do not know what is going to arrive until it does. There are some likely suspects from bird flu and its mutations, as it can move into mammals and so on, but there are others where we do not know whether we should expect that. There has been conversation around dengue and so on today. Some of the tick-borne infections like Crimean-Congo haemorrhagic fever are highly likely to spread to the UK through ticks at some point. There are other infections that can be mosquito-borne, such as Rift Valley fever, which could be the next thing to arrive. The challenge will be early detection because our clinicians do not know what they look like.

Q41 **Carol Monaghan:** If you had to set up a framework that did the crossover, where would you start? What is needed, and how can the UK Government support it?

Professor Lewis: Within the UK?

Carol Monaghan: Yes.

Professor Lewis: I agree with Professor Wood that moves are being made in that direction. One of the biggest gaps and challenges we have faced recently, particularly in responding to the H5 situation, has been putting inter-agency agreement to allow data sharing across UK Government agencies—that is one of the big challenges—and then allowing academic partners, who are also active in this space often through UKRI-funded collaborations, to add value to that data-sharing system. This is not only a challenge on the UK plc side; it is also a challenge on the international side. Openness, timeliness and a framework for robustly sharing data across these "One Health" interfaces, essentially, is absolutely imperative. Until we get that, it is not timely enough. That is one of the biggest challenges. We need to address that in fairly short order, particularly as we have this huge burden of disease for the H5 viruses, but we cannot drop our guard against some of the other endemic diseases in the UK, particularly even swine influenza.

Q42 **Carol Monaghan:** You are talking about how serious it is. Do you think that level of severity is properly understood at Government level?

Professor Lewis: I would say that it is understood at the operational level by the scientists who are doing their level best to work in the system. I do not work for a UK Government agency now, but I would argue that it is perhaps not well understood at a sufficiently high enough level. That needs to be addressed in fairly short order to make sure that colleagues in agencies that are trying to deliver timely science do not face these roadblocks in data sharing and analysis that they are having to work through at the moment.

Carol Monaghan: Professor Wood, do you have something to add, or are you happy with that?

Professor Wood: I suspect that at some point you will ask us about the Nagoya protocol. This protocol was set up internationally to ensure that data, IP and ownership is not stolen by countries like the UK from many places. It applies to pathogen data, and it is not designed for that. It is a huge threat. The international timely sharing of data on pathogens is part of surveillance systems and it needs to be modified very rapidly, or workarounds have to be found, to make sure that we can share data about pathogens that may be emerging in a timely way.

Q43 **Carol Monaghan:** Should we be considering this as an issue of national security?

Professor Wood: Yes.

Professor Lewis: Absolutely.

Q44 **Stephen Metcalfe:** We move nicely into the area I want to talk about, which is the importance of international data sharing for surveillance collaboration. Can you make suggestions about how we might improve the system? Do we need to start from scratch, or can we change what is already there and make sure there is an equitable system in place?

Professor Wood: Professor Lewis has described some of the amazing international laboratory networks which are very well set up to work in a way that is needed with pathogen sharing and pathogen data sharing. The UK can provide huge leadership in trying to explore the barriers for how those can be made most effective. Some of the restrictions are financial; some are regulatory around the Nagoya protocol. I do not think it needs rewriting, but it needs to be reframed for pathogens, in contrast to plants or suchlike that might be really important things that need to be conserved locally.

Professor Lewis: We are already starting to feel the impact of the Nagoya protocol at the moment, in fairness, through the seasonal influenza virus side. While we are able to share the genetic side of things and we are able to share clinical specimens at this point, we are facing significant roadblocks when it comes to moving potential candidate vaccine viruses that we may want to recommend as part of the human seasonal influenza virus through the process to allow them to be released

to reassortment laboratories to develop them further. This comes under something called utilisation.

At that point, I am now having to go bilaterally to each member state that has contributed these clinical specimens or viruses to find their Nagoya focal point and to unilaterally find agreement for their position on prior informed consent and mutually agreed terms for every single virus that we want to move potentially through the system.

This is for all member states that have signed the Nagoya protocol. In some cases, those member states have not reached the stage of putting in the legal framework for the deployment of the Nagoya protocol at a national level, so then it becomes a conversation about whether they would agree outwith that formal framework. It is a hugely complicated field, and we are already finding it is proving challenging when we have human seasonal viruses. Clearly, when we are thinking about new, emerging diseases and sharing of material to assess pandemic risk, this is a challenge we are going to be facing into the future.

Q45 **Stephen Metcalfe:** If we were trying to improve the system, who should lead that work? You do not think we need a new protocol.

Professor Lewis: I do not think we can have a new protocol. We need to find a way to ensure that, as Professor Wood has said, this does not apply to pathogens and genetic sequences, to allow us to function and move these viruses through.

Q46 **Stephen Metcalfe:** Who makes that decision and leads it?

Professor Lewis: I do not know who holds the keys to unlock that because it is an international treaty. Do you know who holds the keys?

Professor Wood: You could have asked a similar question about antimicrobial resistance 10 years ago. What the UK demonstrated through the work of Sally Davies and many different Government Departments was the incredible impact that a UK-led approach to a very complex challenge can on have on delivering real change on the ground internationally. It is not a simple "one body will do this"; it is a question of leadership internationally.

Q47 **Stephen Metcalfe:** If you were advising the person who is going to take that up within the UK, what would their first step be to improve that? Is it engagement?

Professor Wood: "Go and take advice from Sally first," probably.

Stephen Metcalfe: That is a good answer.

Professor Wood: One of the things that I have heard her talk about so compellingly is the way that she was given sufficient seniority that she could work across Government Departments and provide that leadership and get the support from FCDO as well as just thinking about the

Department of Health and Social Care and so on. That is where Britain can make a difference.

Stephen Metcalfe: Brilliant. Thank you very much.

Q48 **Chair:** Just on Nagoya, would it be true to say that it is now a barrier to research collaboration in a speedy way?

Professor Lewis: Yes. It is a potential barrier we are having to make significant effort to overcome on a day-by-day basis.

Professor Wood: Foot and mouth disease is a very good example that has parallels. The international collaboration for vaccine manufacturing is critical. It is not just research that it impacts on but development and preventive measures such as international vaccination, which we rely on.

Q49 **Chair:** Would it be better not to have it than to have it? Is that where it is at? Obviously, it had good intentions behind it.

Professor Lewis: The Nagoya protocol, as I understand it—and I am not the complete expert on this—is to protect member states' IP to a greater or lesser extent. There are countries that have not signed. The United States and Australia have not signed. It is starting to be a significant roadblock. If you think about the spread of infectious diseases, we cannot just cherry-pick which countries we might be lucky enough to have an emerging infection from and hope that they have either been a signatory to the Nagoya protocol, or they have said, "Actually, we agree to prior informed consent for public health benefit, and we are happy to share."

Chair: I understand. That is very clear, and it is very helpful to have that. One of the purposes of this Committee's inquiry is to make recommendations to Government as to what our policy stance should be, so that is very helpful to inform it. Can I thank Professor Lewis and Professor Wood for their evidence today?

Examination of witnesses

Witnesses: Professor Andrew Cunningham and Professor Dirk Pfeiffer.

Q50 **Chair:** I will introduce our final panel of witnesses—one witness in person and one witness joining us virtually. In person, we have Professor Andrew Cunningham. Thank you for being here for the previous panel's evidence, Professor Cunningham. Professor Cunningham is the professor of wildlife epidemiology and deputy director of science at the Institute of Zoology. His work focuses on the threat of disease to wildlife conservation. He is a member of the One Health High-Level Expert Panel, which has an advisory role to the United Nations' partner agencies. Thank you very much for joining us.

We also have joining us virtually Professor Dirk Pfeiffer, who is deputy director of the One Health Poultry Hub. He is also involved in epidemiological research for that and is the professor of "One Health" at

the City University of Hong Kong. Thank you very much for joining us here today.

Perhaps I can start with Professor Cunningham and the concept of "One Health". For Members and members of the public watching these proceedings, can you describe what the concept of "One Health" is as it relates to the area of infectious diseases?

Professor Cunningham: Sure. We often think of human health, animal health and health of the wider environment ecosystems as separate things but with some crossover at certain points. "One Health" used to be thought of as being where they intersect, but these days it is the health of all those things together. It is an integrated approach to the health of humans, animals, be they domesticated or wild, plants and, ultimately, the health of ecosystems and ecosystem function.

Chair: Very good. Thank you. Professor Pfeiffer, are you content with that definition, or do you have anything to add? It seemed very clear to me.

Professor Pfeiffer: I absolutely agree. What I would emphasise—and so has Professor Cunningham—is the role of the ecosystem and the recognition that we are all part of the ecosystem. Animals and humans are part of it instead of it being separate. Admittedly, that is not how I had looked at my area of work until about three or four years ago. The realisation came quite late that we have to adopt that systems perspective, which is what "One Health" is about.

Q51 **Chair:** Thank you very much. Staying with you, Professor Pfeiffer, could you give any examples in your area of research and expertise as to how the "One Health" approach has had an impact and how it has been practised?

Professor Pfeiffer: We could use the One Health Poultry Hub, which is a tremendous example of the UK helping four other countries—India, Sri Lanka, Vietnam and Bangladesh—to implement a "One Health" approach in those nations. What is also really important is that we are looking at prevention. We have not talked enough about that. I have listened to a lot of presentations. We talk about detection, but we also have to get to the root cause. What is happening there is that we are looking at the influence of the poultry production system on a whole range of pathogens that are being generated by the practices and the various factors that were mentioned earlier in terms of the influenza virus, antimicrobial resistance, food borne pathogens, etc.

In the end, there is an impact on humans—they get sick—but the driver in the background is the behaviours and the practices of farmers in how the animals are being produced. It is not just the farmers; there is a whole production chain after that. There is a value chain. There are transporters and wet markets. There are a whole range of activities that need to be considered, and that requires a "One Health" approach. I am a veterinarian, so I look at particular animal pathogens, and then I realise

that, actually, it is about what humans do, how they handle the animals, what they think is important and what is safe and what is not safe.

It was through another UK Government-funded project in the past, the ZELS project, that I learnt the importance of the interaction with social scientists, who helped me to understand why people behave in particular ways that will then influence the risk of emergence of pathogens.

Q52 **Chair:** Thank you, that is very clear. That prevention will be an important part of our inquiry. Professor Cunningham, are there any examples from your area of practice?

Professor Cunningham: There are very few real examples of a "One Health" approach, but one of the best ones I am aware of—and we have already heard it mentioned this morning—is when Nipah virus spilled over from bats to pigs and then from pigs to people in Malaysia and Singapore in 1998 and 1999. A lot of people lost their lives, and the pig industry was pretty much destroyed in that part of the world. A lot of people lost their livelihoods as well.

It turns out that the way this happened was that there was encroachment of pig farming into wildlife habitat, and there was also intensification of the pig farming with very little biosecurity. To help make the pig farms more profitable, there was co-location with fruit orchards, which brought fruit bats to the sites, and there was direct or indirect transmission of the virus from the bats to the pigs, and eventually from the pigs to people. This was over 25 years ago.

Rather than the Malaysian Government abandoning pig farming—the pig farms were pretty much wiped out; they had to cull virtually all the pigs in the country—they made it illegal to encroach into wildlife habitat with pig farming and made it illegal to have co-location of fruit orchards with pig farms. Since then, they have a pig industry again, but there has not been another single documented spillover of Nipah virus, yet there are probably as many fruit bats with as much Nipah virus circulating among them in that country. That approach benefits humans, domesticated animals and wildlife.

Chair: That is very helpful and very clear. Thank you very much for that illustration. I will ask my colleagues to ask some questions, starting with Rebecca Long Bailey and then Dawn Butler.

Q53 **Rebecca Long Bailey:** Thank you. What lessons have been learnt from the covid-19 pandemic that can be applied to "One Health" approaches in preventing emerging diseases, Professor Cunningham?

Professor Cunningham: The covid-19 pandemic has really brought to the fore the importance of not thinking of human beings as separate but, as Professor Pfeiffer said, as a part of the ecosystem. However, this virus got into people, it almost certainly had an origin in a wild species—probably a species of wild bat, but that has not been proved. It is the way people interact with animals, that human-animal, human-wildlife

interface, and the way that we change that with changes in our activities that cause the risks.

I completely agree with Professor Pfeiffer that we should be looking far more at prevention. Yes, preparedness and response and being ready for these things is really important, but rather than just waiting for the next thing to happen why don't we try to stop it happening in the first place? This has not been in the consciousness before. I think that is going be the main lesson to learn from the covid-19 pandemic. Having said that, you will be aware of the current negotiations for a pandemic instrument, an international pandemic accord, and prevention is hardly mentioned in that at the moment. That is all about preparedness and response. It needs to be totally focused on prevention.

Rebecca Long Bailey: Thank you. Professor Pfeiffer.

Professor Pfeiffer: I have to repeat what Professor Cunningham just said. In addition, one thing is the size in the background, while the other aspect is how Government or the policymakers or the different sectors within Government work together. There are some huge lessons to be learnt; some countries have and others have not. I often get asked which country has a really good example of how the "One Health" approach can be done, and there are very few. One example that we have is connected to the research that started in around 2010 for the ZELS project where we worked with Bangladesh. It has a One Health Secretariat in Government where they meet on a regular basis, and they take information from different sources and inform decision making in that way. Nothing is perfect, of course, but this is a good start. We need to see that happening in more places. In some societies, that is much harder to achieve.

The original covid outbreak is a classic example of where there was not a "One Health" approach used in mainland China. It is very obvious. It was very much driven by the human health sector. Whether they have learnt the lesson I do not know, but we cannot allow this sort of thing to happen again. The science is one thing, but let us also look at how policymakers work.

As part of the One Health Poultry Hub, UKRI requires us to have impact, and impact is about what happens at the policy level. So we are now talking to Government Departments and trying to get them to talk to each other. In Vietnam we have done it, and just recently in Bangladesh. India is very complicated. Just imagine. Bangladesh is complicated. I was part of the process in Vietnam. Then you begin to realise it is a lot about political economy. I as a veterinarian do not have a clue how you examine these kinds of things. Who has the power? Who is it that you have to have at the table?

A useful and effective approach to the next pandemic in each country will also depend on how well the power relationships within that particular political system are arranged and where "One Health" actually has been

able to adopt it within that system. There is a lot of work that still needs to be done. That is work outside the UK, elsewhere in the parts of the world that were mentioned before, where those pandemic risks are much higher than they are in Europe or the UK.

Q54 **Rebecca Long Bailey:** Professor Cunningham, you mentioned the world pandemic accord and how prevention was missing from that. On that theme, what actionable policies and strategies would you like to see in there on prevention, and what support is needed from Governments across the world to include those as disciplines within a "One Health" approach?

Professor Cunningham: We talk about all these diseases coming from wildlife. We know of about 260, and it has been estimated that there might be up to 700,000, or possibly more, potentially zoonotic viruses in wildlife. There are some people who want to take the approach that we should try to find out what all those are and develop vaccines and therapeutics against them all, even if it is just done by family. We need to understand that that is not the threat. Humanity has lived with those until now. Now they are becoming a problem for us increasingly, and it is because of what we are doing as human beings, our activities and our socioeconomic drivers. We need to look at that carefully.

One very superficial thing that we could possibly do is that, whenever there is a major infrastructure project or something that is going to change that human-wildlife interface to some degree, there is a "One Health" impact assessment—not just infectious disease but non-infectious disease as well. What might that do? "One Health" impact assessments should be embedded into our socioeconomic activities. That would be a start, but it needs to go further than that.

Rebecca Long Bailey: Thank you. Professor Pfeiffer.

Professor Pfeiffer: Right at the beginning of the pandemic, I used the term "'One Health' risk governance at a world level". We have the Security Council. Why don't we have something like a "One Health" risk governance council? I am probably naive in terms of what is possible or not. This situation demonstrated that we are all in the same boat. We are on this planet, we are dependent on each other, and we are acting each for us, just for us. We are trying to protect ourselves.

In some ways, this was probably just a trial run. The next thing might be much more complex and much more dangerous. In fact, we were probably protected by China having the lockdown fairly early in Wuhan. If that had not happened, I do not want to think how quickly it might have gone around the world. It needs much more of a unified response, which is very difficult to achieve, and I realise that. It needs lobbying.

Coming back to what was mentioned about Dame Sally Davies, it is about going around lobbying and speaking up at international fora regularly so

that it gains traction, because they are all affected by it and they are all worried about it. That is one thing I would suggest.

There are plenty of other things we could talk about, but I want to keep it short. By the way, I should mention the SDGs. I always think the SDGs are part of this game, and "One Health" is in there. Let's not forget about it. I will stop there.

Rebecca Long Bailey: Thank you.

Q55 **Chair:** On the question of an impact assessment for a "One Health" approach, Professor Cunningham, have you had a chance to look at the biosecurity strategy that was published yesterday?

Professor Cunningham: No, I have not.

Chair: It talks about "One Health" but it stopped short of mentioning that, but if you have not had a chance to look at it yet, it would be unfair to ask you some detailed questions about it. Thank you very much.

Q56 **Dawn Butler:** I have one quick question. Thank you very much for your evidence today. I think you are right; we have not really spoken about prevention very much, and that is probably for a number of reasons such as humans not wanting to take responsibility for the role that they play in a pandemic, but also profit margins. As you were speaking, I was thinking that there will be people thinking, "Oh, yes, but the more hens we can cram into the cage the more profit we are going to make," and not thinking about the longer-term health implications and benefits. Is what you would request from Government to have a "One Health" Minister? Do you think that is the pivotal thing that leads to everything else like a "One Health" assessment and the "One Health" risk governance? That is to Professor Cunningham.

Professor Cunningham: "One Health" governance is really important. It is the crux of the matter. I am not sure that a "One Health" Minister would be the way to go. "One Health" should be embedded in every Government Department, including the Treasury. I also think that it should not be functionally managed by individual Departments. There should be a central "One Health"—almost like the secretariat that Dirk mentioned in Bangladesh. Perhaps in something like the Cabinet Office there should be a "One Health" lead who is managing, at least functionally, the "One Health" units or sections within the Government Departments and making sure that they are in constant communication. I have thought about how we do "One Health" governance a lot being on this One Health High-Level Expert Panel, and there isn't a really easy system that fits the way things are done now.

Dawn Butler: That is interesting, thank you. Professor Pfeiffer.

Professor Pfeiffer: Just following on from what Professor Cunningham said, it needs to be adapted to the political system in the country that you are in. You cannot generalise. It needs to be evaluated by specialists

in that field. How can you truly influence policy and bring everybody together? That is hard because we cannot have a single recipe. It has to be tested in different contexts. We are all still learning. We all realise we failed completely with covid. We completely failed, I would say. We were pretty good with the response, to an extent, as a global community, but that was about it. What is it that needs to be done in these different systems? The secretariat from Bangladesh is one example. I am pretty sure that in Vietnam one would have to use a different approach, and I would not know what that is. That requires policy experts who have experience with these political systems to define or come up with ideas of what would be suitable there.

Dawn Butler: Thank you very much. Thank you, Chair.

Q57 **Stephen Metcalfe:** It is pretty clear from listening to your answers that the UK is a fair way off having an integrated "One Health" biosecurity policy. What can we do about that? Is it actually possible? Can you see a way of it being achieved in the UK, or is the political system that Professor Pfeiffer talks about a barrier to it? Is it something we should be aspiring to, and can it be achieved? I would like to hear from both of you.

Professor Cunningham: We should definitely be aspiring to it. Some countries have "One Health" plans. We do not have anything like that of which I am aware. Maybe this biosecurity document is a start. From my understanding, most of the "One Health" area in Government is in the FCDO, but there is a "One Health" unit in DEFRA. I do not know if there is a separate "One Health" specific area in the Department of Health and Social Care or not. I suspect it is in FCDO because we think of the threats coming from somewhere else rather than being here. That is probably the case, but it is complacent to think that that is definitely the case. We are still finding new things that are endemic in our wildlife in the UK that we did not know were there in the UK, some of which can be nasty zoonotic pathogens and some of which may have epidemic or pandemic potential. We should not be complacent and just think it is all coming from somewhere else.

Stephen Metcalfe: No, but you think it is possible to create a "One Health" system in the UK.

Professor Cunningham: Definitely.

Stephen Metcalfe: It just requires political drive.

Professor Cunningham: Yes. It should be in every country.

Stephen Metcalfe: Okay. Dirk, do you agree with that?

Professor Pfeiffer: I do. As a German, I can say that you are doing a lot better than 99% of the countries in the world, honestly. I worked for 11 years in New Zealand. I worked for seven years in the UK. I am now in Hong Kong. You are doing pretty well. You can do better, of course, and

that is your strength—to reflect and challenge yourself and get better. I think you can.

Stephen Metcalfe: That sounds like my school report.

Professor Pfeiffer: But it is not just about you; I am not blowing my own trumpet here, but, again, as mentioned by previous speakers, it is also about engagement with the international community. The people you have trained in your universities are your asset. They are in every country in the world. That is what you need to keep doing. As well as having the projects, you need to engage with the international community when it comes to research training where you also have projects in the countries. It was shocking when the budget was cut two years ago, including for "One Health". It is the soft power. It is good stuff that you are doing. You are protecting people in the UK with those investments. Be pleased with what you are doing, but you can do better. I am pretty sure.

Stephen Metcalfe: Thank you very much for that.

Professor Cunningham: May I just add to that? When I was answering, I was thinking about the policy, but Dirk is absolutely right about the training, the capacity building and the research. Yes, we do a good job in this country, but there are barriers to being able to do a really good job here. Dirk is absolutely right: social scientists are really key to a "One Health" approach. We tend to think of virologists, vets and medics, but the social scientists are really key, yet we do not talk to each other very well at all. One of the reasons we do not talk to each other is because we speak different languages, in many regards.

There are some projects. There was some really good funding like the ZELS and the ESPA, Ecosystem Services For Poverty Alleviation, around that brought natural and social scientists together to work on these issues, but they are funded for three or four years. People stay in their own institutions, and that is their first priority. It takes three or four years, or certainly two or three years, to really get to know each other, work well together and understand each other and so on, especially when you are talking about the cross-disciplinary side. You should bring economics into that as well.

We need to look at removing those structural and cultural barriers, and either have long-term funding—this goes back to the very first panel this morning; funding needs to be over the long term to be effective—or think about bringing people together under one roof so that they are all working together and have the common priorities and common allegiances.

Q58 **Stephen Metcalfe:** Thank you. I have one final quick question, if I may, Chair. Dirk, you said we are doing 99% better than most other countries. Which is the 1% that is doing better than us, and can we learn anything from them?

Professor Pfeiffer: It is usually city states. You can take Singapore as an example. I am sure New Zealand is not doing a bad job. Australia is not doing a bad job either. Interestingly, there is a British influence in many of those places, even if it was a little while ago. It is not that there is someone at the forefront and they have the answer. We are all learning. That is the other thing about it: to look at what the others are doing, sharing that experience and figuring out what actually works locally.

Stephen Metcalfe: Perfect, thank you. Andrew, do you want to add anything to that—the 1%?

Professor Cunningham: No, Dirk is right. We are all trying to find our way forward with this. We need to be learning from each other.

Stephen Metcalfe: Perfect.

Q59 **Chair:** We take written evidence for these inquiries as well. The written evidence we have had from DEFRA, the UK Department responsible, says that there is syndromic surveillance of diseases, which is to say that notifiable diseases like bovine TB are notified, but my understanding is that currently there is no funding for broad surveillance of non-notifiable pathogens. The research agency UKRI, in its written evidence, said that we should have broader scrutiny and monitoring. Professor Cunningham, do you agree with its recommendation?

Professor Cunningham: Absolutely, yes. I work at the Institute of Zoology, and we have a very small amount of funding each year from DEFRA to carry out wildlife disease surveillance, but it is restricted to garden birds, reptiles, amphibians and hedgehogs. The main threats are likely to come from rodents and bats. We do not have any systematic disease surveillance in this country for rodents. For bats, it is very pathogen-specific; we know it is something that is already there, or we suspect it is going to be there, so we do not have broad-scale surveillance. We definitely need to increase not only the surveillance in domesticated species but in wildlife as well.

Chair: Thank you very much. Rebecca Long Bailey has a couple of final questions.

Q60 **Rebecca Long Bailey:** We have already touched on how effective international Governments are at adopting a "One Health" approach, but are "One Health" principles being sufficiently embraced by the wider scientific community? If not, what can researchers or funding councils do to support the adoption of those approaches in a research context? I will start with Professor Pfeiffer this time.

Professor Pfeiffer: I will use the opportunity to mention that the relevant initiative in the UK in 2004 or 2006 was an example where the funder required social scientists to be included. It was about farm production systems. That is an example of what funders can do in order

to encourage a "One Health" approach. It was the same with the hubs—the GCRF; there was also a push for that.

At the moment, we are all within our disciplinary silos, as you know. I do not have to repeat that. Our promotion structures are tailored to that. The publications that we produce go to journals within our discipline. It is easier to get a paper that is highly cited in your own discipline than to go to a much broader one. That is changing to an extent, I have to say, but very slowly.

If I was honest, I would not probably recommend to a young researcher who has to worry about their career pathway to immediately get into "One Health", because that may be taking risks, if the alternative is to be a specialist in their discipline and then progress accordingly. That is something that needs to be addressed. I know some of this has already been addressed, but it is happening very slowly, whereas the speed at which the challenges are arising is much greater. That is where I see a need to provide incentives to the scientific community to work together.

Rebecca Long Bailey: Thank you. Professor Cunningham.

Professor Cunningham: It goes back to the last point I made. It is the way that we fund science not just in this country but internationally. We fund medics to do medical stuff; we fund vets to do veterinary stuff. We do not fund, very often, social scientists, natural scientists, ecologists, vets and medics to work together with economists and so on. That needs to change. Doing it over three or four years is not going to be good enough, because it takes a long time for people to learn each other's languages, how they work, their different fields and so on. We have to develop some sort of structural way of doing this or bring in 10-year funding regimes or something. There is a structural barrier there to doing what we need to do.

Q61 **Rebecca Long Bailey:** I have one very final question. I know that you are certainly both advocating a holistic approach across disciplines. Specifically, what lessons can be learnt from the veterinary sciences' approach to tackling emerging diseases that can be applied in a public health setting?

Professor Cunningham: I have not worked as a standard veterinarian for a long time. Gosh, that question is going to take a bit of thought. It is a difficult one to answer. Nothing leaps out at me immediately. I usually tend to work across disciplines but within the natural sciences. Not a lot, would be my answer.

Rebecca Long Bailey: Okay, thank you. Professor Pfeiffer.

Professor Pfeiffer: I have one, and that is the food system. The food system that we have is just a disaster. That is part of the problem—the way we produce food on a global level and a national level. Vets play a key role in shaping that food system. My training as a vet was about helping farmers to increase productivity. That has an impact on the

ecosystem that is just terrible. We need to change our mindsets and our community, and we need to change those food systems as a society. This will be one action that is important.

That is what I am teaching in Hong Kong on our vet course. The very first class that our students get is on "One Health", and I am very proud of that. I take them away from wanting to be clinicians. I show them pictures of the ecosystem and their responsibility for it. Perhaps that is easier for vets because they work with animals. They may be on farms. It is much more of a systems activity than it is to work with humans on an individual basis in hospitals. That is maybe where we have an advantage. We work with multiple species, so maybe it is a little bit easier for us to adopt a "One Health" perspective.

Rebecca Long Bailey: Thank you.

Chair: Do you want to come in, Professor Cunningham?

Professor Cunningham: I was just going to concur that our food systems globally are one of the biggest problems that we have. They are completely unsustainable. If they are not changed, there is not going to be humanity. We have to change our food systems.

Chair: Very good. That is very clear. Can I thank Professor Cunningham and Professor Pfeiffer, who is joining us from Hong Kong? Can I thank all of our witnesses who have given evidence this morning? You have got our inquiry off to a terrific start, and we look forward to taking further evidence over the weeks ahead. That concludes this meeting of the Committee.